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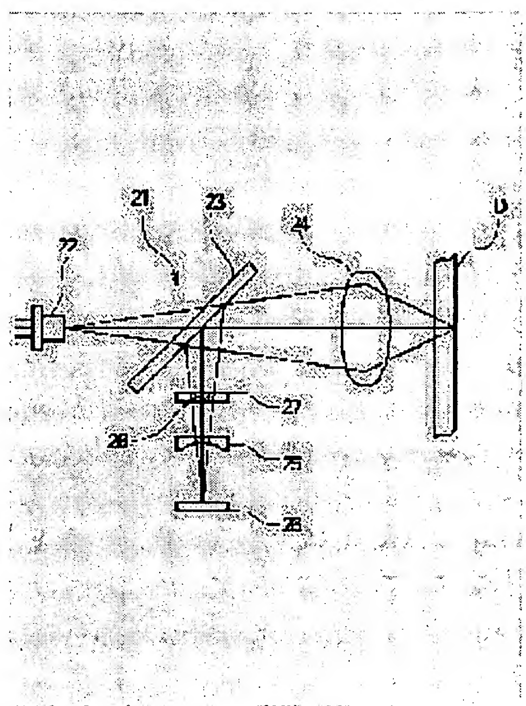
(54) **OPTICAL HEAD DEVICE**

(57)Abstract:
PURPOSE: To suppress the lowering of modulation factor low and to improve reading accuracy even at the time of making the recording pit of a disk high density.
CONSTITUTION: An optical head device 21 is constituted of a light source 22 consisting of a laser diode, etc., a beam splitter 23, a condenser lens 24, a cylindrical lens 25, a photodetector 26 consisiting of a pin photodiode, etc., and an attenuation filter 27 and a light shielding belt 28 prolonging to a tracking direction in the center part of a linear velocity direction is formed on the attenuation filter 27. The beam of an area containing the center part is shielded for a reflected beam from the disk D by the light shielding belt 28 and the beam of other peripheral part passes through. Thus, the ratio of an AC component to a DC component is increased for the modulation of a high space frequency and the modulation factor is increased.



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TITLE: OPTICAL HEAD DEVICE

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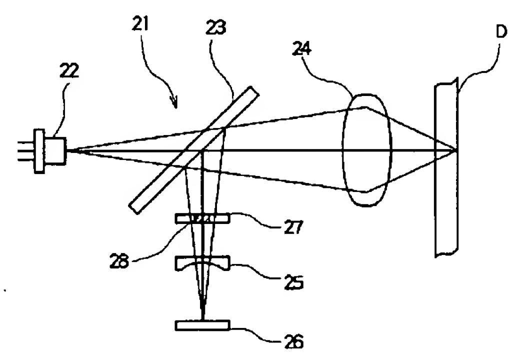
(54)【発明の名称】　光ヘッド装置

(57)【要約】
【目的】　ディスクの記録ピットを高密度化した場合であっても、変調度の低下を低く抑えることができ、読み取り精度が向上する
【構成】　光ヘッド装置２１は、レーザダイオード等からなる光源２２と、ビームスプリッタ２３と、集光レンズ２４と、シリンドリカルレンズ２５と、ピンフォトダイオード等からなる光検出器２６と、減衰フィルタ２７から構成され、前記減衰フィルタ２７に、線速度方向の中心部にてトラッキング方向に延びた遮光帯２８が形成されている。この遮光帯２８はディスクＤからの反射光に対し中心部を含む領域の光を遮光し、その他の周辺部の光を通過させる。これにより高い空間周波数の変調に対しＤＣ成分に対するＡＣ成分の比率を高くして変調度を高めることができる。

図１



【特許請求の範囲】

【請求項1】　光源からの出射光を微小スポットとして記録媒体面上に集光し、この集光点からの反射光の光強度を光検出器により検出して情報の再生を行なう光ヘッド装置において、前記反射光に対し中心部を含む所定の領域の光強度をその他の周辺部の光強度より減衰させる手段を設けたことを特徴とする光ヘッド装置。

【発明の詳細な説明】

【0001】

【産業上の利用分野】本発明は、光源からの出射光を微小スポットとして記録媒体面上に集光し、この集光点からの反射光の光強度を光検出器により検出して情報の再生を行なう光ヘッド装置において、特に情報が高密度に記録されたディスクの再生に適した光ヘッド装置に関する。

【0002】

【従来の技術】従来例を図面を参照して説明する。図8は従来の光ヘッド装置を示す概略図、図9はディスクに形成されたピットによる光の変調状態を説明するための説明図である。図8に示す光ヘッド装置1は、レーザダイオード等からなる光源2と、平板ビームスプリッタ3と、集光レンズ4と、シリンドリカルレンズ5と、ピンフォトダイオード等からなる光検出器6とから構成されている。

【0003】この光ヘッド装置1は、光源2からの出射光を集光レンズ4を介して微小スポットとしてディスク（記録媒体面）D上に集光し、この集光点からの反射光（以下「戻り光」ともいう）の光強度をシリンドリカルレンズ5を介して光検出器6により検出して情報の再生を行なうようになっている。このような再生方法が可能なのは、集光レンズ4により集光された光が微小スポットの入力光として前記ディスクDに形成されたピットPに照射されると、このピットPにより入力光が変調されて戻り光の強度が変化するためである。このような方式の光ヘッドによる読み取り精度は、戻り光の光学的な変調度に大きく左右される。

【0004】ここで上記変調度とは、

変調度=｛（ＲＦ信号の最大値）－（ＲＦ信号の最小値）｝／｛（ＲＦ信号の最大値）＋（ＲＦ信号の最小値）｝

すなわち変調度＝（再生信号のＡＣ成分）／（再生信号のＤＣ成分）×１／２

である。なお、上記の式において、光学的な変調度をＲＦ信号により表わしているのは、戻り光の光量が再生信号である電気的なＲＦ信号に比例しているからである。

【0005】また、上記の変調度と、光学式再生におけるＣ／Ｎ比（Carrier to Noise ratio）との間には、ノイズレベルが一定であるとすると、

Δ（Ｃ／Ｎ）＝２０・ｌｏｇ（変調度の変化量）

｛ただし、Δ（Ｃ／Ｎ）：Ｃ／Ｎ比の変化量｝

の関係がある。すなわち、Ｃ／Ｎ比を向上させてエラーレートを維持するためには、前記変調度を高くすることが必要である。

【0006】ここでピットＰからの戻り光による再生情報は、光学的に様々な空間周波数の情報であり、高密度のピット列からは高い空間周波数の光学情報が読み取られて高い周波数の再生ＲＦ信号が得られる。また低密度のピット列からは低い空間周波数の光学情報が得られて低い周波数の再生ＲＦ信号が得られる。

【0007】集光レンズ（対物レンズ）４の開口Ｒ（図９（ａ）参照）に戻ってくる光には、メディア上の情報が空間周波数の光学情報が含まれているが、戻り光において空間周波数の高低により、開口内にて影響が現れる位置が異なっている。すなわち、図9においてディスクＤの移動方向が紙面方向であるとすると、高い空間周波数の光学情報ほど、レンズの開口の外側に影響が現れる。例えば、空間周波数の高いピット列からの戻り光のうち、レンズ開口の中心部からＬｉとＬｏで示すように外周部にいくにしたがって変調による影響が大きくなる。

【0008】したがって、一定の値の周波数（カットオフ周波数）以上の空間情報はＬｏで示すようにレンズ開口Ｒより外側に出てしまい情報を伝達する（読み取る）ことができなくなる。またそれよりも低い周波数の空間情報はＬｉに示すようにレンズ開口Ｒの外周部に影響が生じるようになり、カットオフ周波数に近づくにしたがって情報の伝達がしずらくなる。

【0009】

【発明が解決しようとする課題】以上から、光ヘッド装置において、記録ピットを高密度化したディスクを再生した場合、図１０に示すように、記録ピットの密度が高くなり、情報の空間周波数が高くなるにしたがって、変調度が低下しＣ／Ｎが劣化することになる。よって例えば図１０に示した線図の特性を有する装置の場合には、空間周波数の密度すなわちピット密度（単位寸法に対するピット数）が例えば０．８０／μm以上になると変調度が大幅に低下して、情報の再生におけるＣ／Ｎ値がきわめて悪くなる。よって図8に示したような従来構造の光ヘッド装置を使用した再生機器では、例えばピット密度を高くするなどのメディアの高密度化に限界がある。

【0010】本発明は上記課題を解決するためのものであり、メディアの記録密度を高くしても、戻り光を検出するときの変調度を高くでき、Ｃ／Ｎ比の低下を防止できる光ヘッド装置を提供することを目的とするものである。

【0011】

【課題を解決するための手段】本発明による光ヘッド装置は、光源からの出射光を微小スポットとして記録媒体面上に集光し、この集光点からの反射光の光強度を光検出器により検出して情報の再生を行なう光ヘッド装置に

おいて、前記反射光に対し中心部を含む所定の領域の光強度をその他の周辺部の光強度より減衰させる手段を設けたことを特徴とするものである。

【0012】

【作用】上記手段では、記録媒体からの反射光のうち中心部を含む所定の領域の光強度をその周辺部より低下させている。よって戻り光において、高い空間周波数の変調成分が、低い空間周波数の変調成分よりも高い比率で得られるようになる。すなわち前述のように変調度は（ＡＣ成分／ＤＣ成分）により得られるが、中心部の光強度を低下させることにより分母のＤＣ成分の比率が低下し、高い空間周波数に対する変調度が高くなる。よってメディアにおける情報の記録密度を高くした場合であっても、読み取り精度は高くなる。

【0013】

【実施例】以下、本発明の実施例を図面により説明する。図１は本発明に係る一実施例の光ヘッド装置を示す概略平面図、図２は減衰フィルタを示す平面図である。図１に示す光ヘッド装置２１は、レーザダイオード等からなる光源２２と、平板ビームスプリッタ２３と、集光レンズ２４と、シリンドリカルレンズ２５と、ピンフォトダイオード等からなる光検出器２６とを有しており、さらに戻り光が光検出器２６に至る経路に減衰フィルタ２７が介装されている。

【００１４】この光ヘッド装置２１は、光源２２からの出射光を集光レンズ２４を介して微小スポットとしてディスク（記録媒体面）Ｄ上に集光し、この集光点からの反射光の光強度を減衰フィルタ２７と、シリンドリカルレンズ２５とを介して光検出器２６により検出して情報の再生を行なうようになっている。

【００１５】図２に示すように前記減衰フィルタ２７は、ディスクＤに対する線速度方向の中心部にてトラッキング方向（＝ディスクＤの半径方向）に延びる遮光帯２８が形成されている。この遮光帯２８は、ディスクＤからの反射光に対し中心部を含む領域の光を遮光し、その他の周辺部の光のみを通過させるためのものである。なお、本実施例ではこの遮光帯２８は光を完全に遮光するものとしているが、この遮光帯２８において光を完全に遮断する必要はなく、他の部分よりも透過光量が低下するものであればよい。

【００１６】上記構成の光ヘッド装置２１の作用について説明する。光源２２から出射された光はビームスプリッタ２３を通過して、集光レンズ２４によりディスクＤの表面に集光される。この集光された光がディスクＤのピットにより変調されて、前記集光レンズ２４を介してビームスプリッタ２３により直角に反射され前記減衰フィルタ２７に導かれ、これを透過して光検出器２６により検出される。この減衰フィルタ２７では、前記遮光帯２８により中心部分を含む領域の光が遮光帯の形成面積に応じて遮光され、線方向に対する両側の透過光量の比率が中心部の遮光帯２８の部分よりも高くなる。

【００１７】前述のように、高い空間周波数の変調成分は、戻り光に対して線方向の両側に多く影響が残る。そして高い空間周波数の変調成分の影響の少ない中心部の光を除去している。よって戻り光の変調成分において、高い空間周波数ではＤＣ成分の比率に対するＡＣ成分の比率が高くなり、変調度が高くなる。よって戻り光による再生信号では、Ｃ／Ｎ比が向上し、読み取り精度が高くなる。

【００１８】上記構成の光ヘッド装置２１による、減衰フィルタ２７の遮光率に対する空間周波数と変調度との関係を示す線図を図７に示す。なお、遮光率は前記遮光帯２８の幅をｄ，前記減衰フィルタ２７に対する戻り光の開口径をａとしたときの百分率により表わされ、

遮光率（％）＝（ｄ／ａ）×１００

により算出される値とする。

【００１９】図７の線図に示すように、遮光率を２０％ないし６０％の範囲で様々に変更した場合、空間周波数が高く（ピット密度が高く）なっても、変調度の低下は図１０に示す従来例よりも抑えられる。また、遮光率を増せば増すほど空間周波数の増加に対する変調率の低下の割合が低く抑えられる。この結果、ディスクの記録ピットを高密度化した場合であっても、変調度の低下を低く抑えることができ、Ｃ／Ｎ比の劣化を防止でき、読み取り精度を向上させることができる。

【００２０】本発明は上記実施例に限定されず種々の変形実施が可能である。例えば、前記遮光帯の形状を図３（ａ）に示す概略Ｉ字状に、同図（ｂ）に示すように概略木の葉状に、同図（ｃ）に示すように円形等にしてそれぞれ戻り光の中心部を含む所定の領域の光を遮光して光の強度を減衰させる様にしてもよい。また、図４に示すように減衰フィルタ２７を複数に分割（図示実施例では5分割）してそれぞれ異なった遮光率の部材Ｘ，Ｙ，Ｚにより形成してもよい。

【００２１】さらに、前記反射光に対し、中心部を含む所定の領域の光強度をその他の周辺部の光強度より減衰させる手段として、図５に示すように、前記光検出器２６としてのピンホトダイオードを線方向に８分割して、中心部（戻り光の低周波成分に対応する部分）を比較的小さく４分割（Ｂ，Ｃ，Ｆ，Ｇ）し、他の部分をこれらの外側を挟むように４分割（Ａ，Ｄ，Ｅ，Ｈ）してもよい。この場合、図６に示すように記録情報に対応するＲＦ信号の検出には、中心部Ｂ，Ｃ，Ｆ，Ｇへの戻り光を検出せず、（Ａ＋Ｄ＋Ｅ＋Ｈ）の演算結果を使用する。これにより上記同様に戻り光の中心部を含む領域の光の強度を減衰させる効果を得る。

【００２２】そして、フォーカスエラー信号は、

（Ａ＋Ｂ＋Ｇ＋Ｈ）－（Ｃ＋Ｄ＋Ｅ＋Ｆ）

の演算結果により検出し、トラッキングエラー信号は、

（Ａ＋Ｂ＋Ｃ＋Ｄ）－（Ｅ＋Ｆ＋Ｇ＋Ｈ）

の演算結果により検出する。

【0023】

【発明の効果】以上のように本発明によれば、ディスクの記録ピットを高密度化した場合であっても、変調度の低下を低く抑えることができ、読み取り精度が向上する光ヘッド装置を提供することができる。

【図面の簡単な説明】

【図1】本発明に係る一実施例の光ヘッド装置を示す概略平面図である。

【図2】減衰フィルタを示す平面図である。

【図3】（ａ）ないし（ｃ）は減衰フィルタの変形例を示す平面図である。

【図4】減衰フィルタの変形例を示す平面図である。

【図5】ピンフォトダイオードの変形例を示す平面図である。

【図6】戻り光のピンホフォトダイオードへの入射状態を示す側面図である。

【図7】遮光率に対する空間周波数と変調度との関係を示す線図である。

【図8】従来の光ヘッド装置を示す概略平面図である。

【図9】ディスクに形成されたピットによる光の変調状態を説明するための図である。

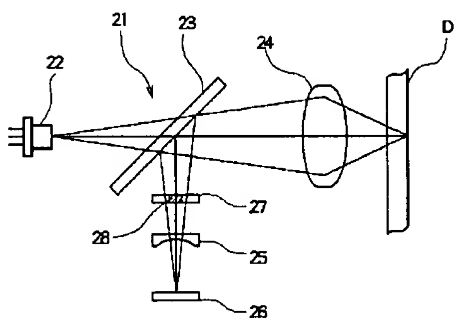
【図10】従来装置における空間周波数と変調度の変化との関係を示す線図である。

【符号の説明】

21　光ヘッド装置
22　光源
23　ビームスプリッタ
24　集光レンズ
25　シリンドリカルレンズ
26　光検出器
27　減衰フィルタ
28　遮光帯

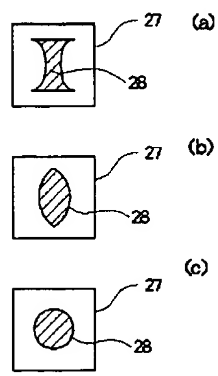
【図1】

図1



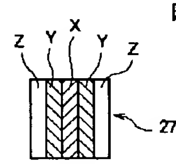
【図3】

図3



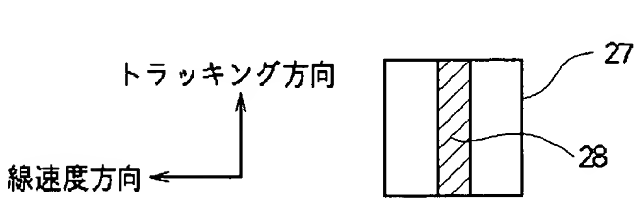
【図4】

図4



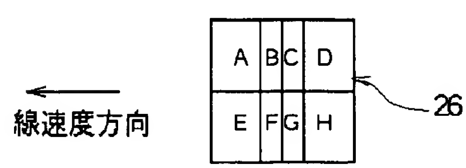
【図2】

図2



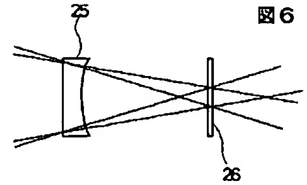
【図5】

図5



【図6】

図6



【図7】

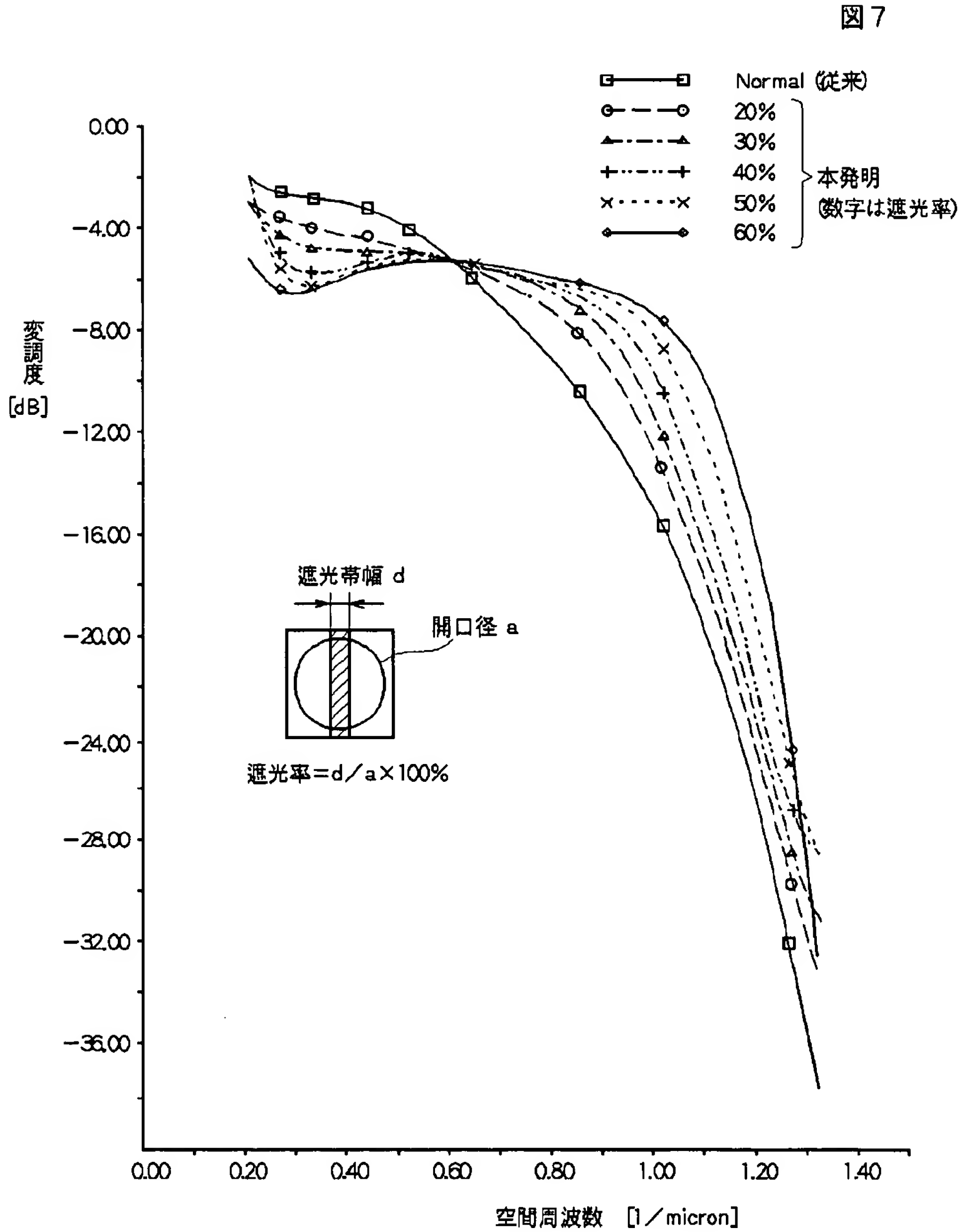


図7
Normal (従来)
20%
30%
40%
50%
60%
本発明
(数字は遮光率)
0.00
-4.00
-8.00
-12.00
-16.00
-20.00
-24.00
-28.00
-32.00
-36.00
変調度
[dB]
0.00
0.20
0.40
0.60
0.80
1.00
1.20
1.40
空間周波数 [1／micron]
遮光帯幅 d
開口径 a
遮光率＝d／a×100%

【図8】

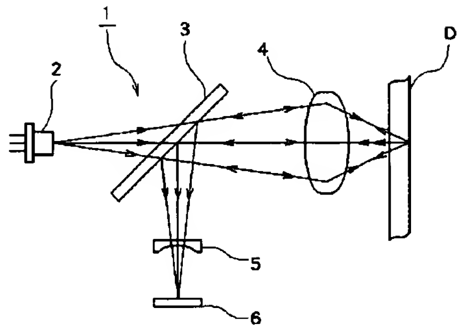


図8
1
2
3
4
D
5
6

【図9】

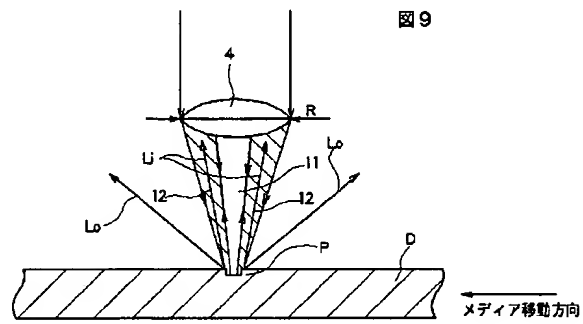


図9
4
R
Li
Lo
11
12
12
Lo
P
D
メディア移動方向

【図10】

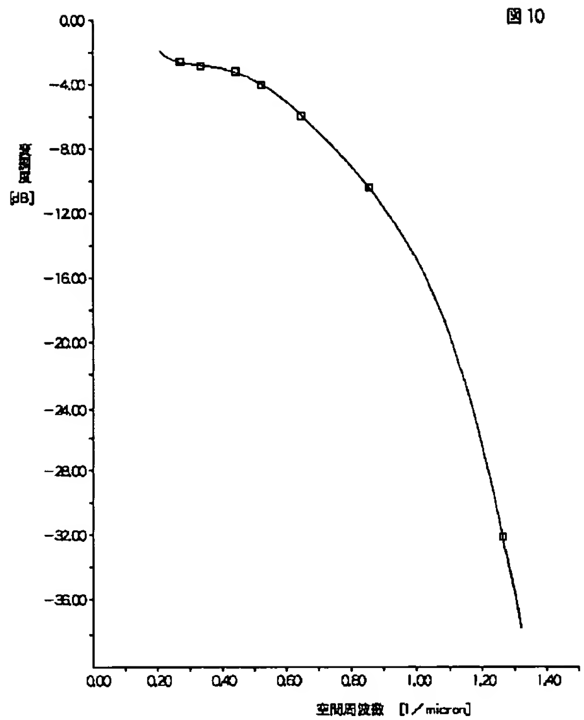


図10
0.00
-4.00
-8.00
-12.00
-16.00
-20.00
-24.00
-28.00
-32.00
-36.00
[dB]
0.00
0.20
0.40
0.60
0.80
1.00
1.20
1.40
空間周波数 [1／micron]

CLAIMS

[Claim(s)]
[Claim 1] Optical head equipment characterized by to establish a means attenuate optical reinforcement of a predetermined field which includes a core to said reflected light from optical reinforcement of other peripheries in optical head equipment which condenses on a record medium side , detects optical reinforcement of the reflected light from this condensing point with a photodetector , and reproduces information by using outgoing radiation light from the light source as a minute spot .

[Translation done.]

* NOTICES *

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention condenses on a record-medium side by using outgoing radiation light from the light source as a minute spot, and relates to the optical head equipment suitable for playback of the disk with which especially information was recorded on high density in the optical head equipment which detects the optical reinforcement of the reflected light from this condensing point with a photodetector, and reproduces information.
[0002]
[Description of the Prior Art] The conventional example is explained with reference to a drawing. The schematic diagram showing the optical head equipment of the former [drawing 8] and drawing 9 are explanatory drawings for explaining the modulation condition of the light by the pit formed in the disk. The optical head equipment 1 shown in drawing 8 consists of the light source 2 which consists of a laser diode etc., the plate beam splitter 3, a condenser lens 4, a cylindrical lens 5, and a photodetector 6 that consists of a pin photodiode etc.
[0003] This optical head equipment 1 condenses the outgoing radiation light from the light source 2 on Disk (record-medium side) D as a minute spot through a condenser lens 4, detects the optical reinforcement of the reflected light (henceforth "return light") from this condensing point with a photodetector 6 through a cylindrical lens 5, and reproduces information. The thing in which such a playback method is possible is for input light to be modulated by this pit P and for return luminous intensity to change, when the light condensed with the condenser lens 4 is irradiated by the pit P formed in said disk D as an input light of a minute spot. The reading precision by the optical arm head of such a method is greatly influenced by the optical modulation factor of return light.
[0004] here -- the above-mentioned modulation factor -- modulation factor ={(maximum of RF signal) - (minimum value of RF signal)}/{(maximum of a RF signal) + (minimum value of a RF signal)}
That is, it is modulation factor =(AC component of regenerative signal)/(DC component of regenerative signal) x1/2. In addition, in the above-mentioned formula, the RF signal expresses the optical modulation factor because the quantity of light of return light is proportional to the electric RF signal which is a regenerative signal.
[0005] Moreover, supposing a noise level is fixed between the above-mentioned modulation factor and the C/N ratio (Carrier to Noise ratio) in optical playback, they are delta(C/N) = 20 and log (variation of a modulation factor).
{However, variation of delta(C/N):C/N ratio}
There is ******. That is, in order to raise a C/N ratio and to maintain an error rate, it is required to make said modulation factor high.
[0006] The playback information by the return light from Pit P is the information on various spatial frequency optically here, from the pit train of high density, the optical information of high spatial frequency is read and the playback RF signal of high frequency is obtained. Moreover, from the pit train of low density, the optical information of low spatial frequency is acquired and the playback RF signal of low frequency is obtained.
[0007] Although the optical information whose information on media is spatial frequency is included in the light which returns to the opening R (refer to drawing 9 (a)) of a condenser lens (objective lens) 4, in return light, the location where effect appears within a opening changes with height of spatial frequency. That is, supposing the migration direction of Disk D is the direction of space in drawing 9 , in the optical information of high spatial frequency, effect will appear in the outside of the opening of a lens. For example, the effect by the modulation becomes large as Li and Lo show from the core of a lens opening among the return light from a pit train with high spatial frequency and it goes to the periphery section.
[0008] Therefore, as for the space information more than the frequency (cut off frequency) of a fixed value, what (it reads) it comes out outside the lens opening R, and information is transmitted for as Lo shows becomes impossible. moreover, as shown in Li, effect comes to produce the space information on frequency lower than it in the periphery section of the lens opening R, and a cut off frequency is approached -- alike -- following -- informational transfer -- carrying out -- ****** -- **
[0009]
[Problem(s) to be Solved by the Invention] As mentioned above, in optical head equipment, a modulation factor will fall and C/N will deteriorate as are shown in drawing 10 , and the density of a record pit becomes high and informational spatial frequency becomes high, when the disk which carried out densification of the record pit is played. Therefore, if it becomes more than 0.80/micrometer in the case of the equipment which has the property of the diagram shown, for example in drawing 10 , the density (the number of pits to an unit size), i.e., the pit density, of spatial frequency, a modulation factor will fall

sharply and C/N-ary in informational playback will get very bad. Therefore, by the playback device which used the optical head equipment of structure conventionally [as shown in drawing 8], a limit is in the densification of media, such as making pit density high, for example.
[0010] This invention is for solving the above-mentioned technical problem, and even if it makes recording density of media high, the modulation factor when detecting return light can be made high, and it aims at offering the optical head equipment which can prevent the fall of a C/N ratio.
[0011]
[Means for Solving the Problem] The optical head equipment by this invention is characterized by to establish a means attenuate optical reinforcement of a predetermined field which includes a core to said reflected light from optical reinforcement of other peripheries in optical head equipment which condenses on a record medium side , detects optical reinforcement of the reflected light from this condensing point with a photodetector , and reproduces information by using outgoing radiation light from the light source as a minute spot .
[0012]
[Function] With the above-mentioned means, the optical reinforcement of the predetermined field which includes a core among the reflected lights from a record medium is reduced from the periphery. Therefore, in return light, the high modulation component of spatial frequency comes to be obtained by the ratio higher than the modulation component of low spatial frequency. That is, although a modulation factor is obtained by (AC component / DC component) as mentioned above, by reducing the optical reinforcement of a core, the ratio of DC component of a denominator falls and the modulation factor to high spatial frequency becomes high. Therefore, reading precision becomes high even if it is the case where recording density of the information in media is made high.
[0013]
[Example] Hereafter, a drawing explains the example of this invention. The outline plan showing the optical head equipment of one example which drawing 1 requires for this invention, and drawing 2 are the plans showing an attenuation filter. The optical head equipment 21 shown in drawing 1 has the light source 22 which consists of a laser diode etc., the plate beam splitter 23, the condenser lens 24, the cylindrical lens 25, and the photodetector 26 that consists of a pin photodiode etc., and the attenuation filter 27 is infixed in the path to which return light results in a photodetector 26 further.
[0014] This optical head equipment 21 condenses the outgoing radiation light from the light source 22 on Disk (record-medium side) D as a minute spot through a condenser lens 24, detects the optical reinforcement of the reflected light from this condensing point with a photodetector 26 through the attenuation filter 27 and a cylindrical lens 25, and reproduces information.
[0015] As shown in drawing 2 , the protection-from-light band 28 with which said attenuation filter 27 is prolonged in the direction of tracking (= radial [of Disk D]) in the core of the linear-velocity direction over Disk D is formed. This protection-from-light band 28 is for shading the light of the field which includes a core to the reflected light from Disk D, and passing only the light of other peripheries. In addition, although this protection-from-light band 28 shall shade light completely in this example, it is not necessary to intercept light completely in this protection-from-light band 28, and the amount of transmitted lights should just fall rather than other portions.
[0016] An operation of the optical head equipment 21 of the above-mentioned configuration is explained. The light by which outgoing radiation was carried out from the light source 22 passes a beam splitter 23, and is condensed by the surface of Disk D with a condenser lens 24. The pit of Disk D becomes irregular, it is reflected by the right angle by the beam splitter 23 through said condenser lens 24, and this condensed light is led to said attenuation filter 27, penetrates this, and is detected by the photodetector 26. With this attenuation filter 27, the light of the field which contains a part for a core with said protection-from-light band 28 is shaded according to the formation area of a protection-from-light band, and the ratio of the amount of transmitted lights of the both sides to the direction of a line becomes higher than the portion of the protection-from-light band 28 of a core.
[0017] As mentioned above, as for the high modulation component of spatial frequency, effect remains on both sides of the direction of a line mostly to return light. And the light of a core with little effect of the modulation component of high spatial frequency is removed. Therefore, in the modulation component of return light, with high spatial frequency, the ratio of AC component to the ratio of DC component becomes high, and a modulation factor becomes high. Therefore, in the regenerative signal by return light, a C/N ratio improves and reading precision becomes high.
[0018] The diagram showing the relation of the spatial frequency and the modulation factor to the rate of protection from light of the attenuation filter 27 by the optical head equipment 21 of the above-mentioned configuration is shown in drawing 7 . In addition, the rate of protection from light is expressed by the percentage when setting the diameter of a opening of return light [as opposed to d and said attenuation filter 27 for the width of face of said protection-from-light band 28] to a, and let it be the value computed by rate (%) of protection from light =(d/a)x100.
[0019] As shown in the diagram of drawing 7 , when the rate of protection from light is variously changed in 20% thru/or 60% of range, even if spatial frequency becomes high (pit density is), the fall of a modulation factor is suppressed rather than the conventional example shown in drawing 10 . Moreover, the more it increases the rate of protection from light, the more the rate of decline in the percent modulation to the increment in spatial frequency is stopped low. Consequently, even if it is the case where densification of the record pit of a disk is carried out, the fall of a modulation factor can be suppressed low, deterioration of a C/N ratio can be prevented, and reading precision can be raised.
[0020] This invention is not limited to the above-mentioned example, but various deformation implementation is possible for

it. for example, the configuration of said protection-from-light band is shown in this drawing (b) in the shape of [which is shown in drawing 3 (a)] an outline of I characters -- as -- an outline -- leaves -- the light of the predetermined field which makes it a round shape etc. and includes the core of return light in a **, respectively as shown in this drawing (c) is shaded, and you may make it attenuate luminous intensity Moreover, you may form by the members X, Y, and Z of a rate of protection from light which divided the attenuation filter 27 into plurality (an illustration example five division), and is different, respectively as shown in drawing 4 .

[0021] Furthermore, as the optical reinforcement of a predetermined field including a core is shown in drawing 5 to said reflected light as a means attenuated from the optical reinforcement of other peripheries The pin photo diode as said photodetector 26 may be divided into eight in the direction of a line, a core (portion corresponding to the low-frequency component of return light) may be quadrisected comparatively small (B, C, F, G), and other portions may be quadrisected so that it may face across these outsides (A, D, E, H). In this case, as shown in drawing 6 , return light to Cores B, C, F, and G is not detected for detection of the RF signal corresponding to recording information, but the result of an operation of (A+D+E+H) is used for it. The effect of attenuating the luminous intensity of the field which includes the core of return light like the above by this is acquired.

[0022] And a focal error signal is (A+B+G+H)-(C+D+E+F).

********** detects and a tracking error signal is (A+B+C+D)-(E+F+G+H).

********** detects.

[0023]

[Effect of the Invention] As mentioned above, according to this invention, even if it is the case where densification of the record pit of a disk is carried out, the fall of a modulation factor can be suppressed low and the optical head equipment whose reading precision improves can be offered.

[Translation done.]

TECHNICAL FIELD

[Industrial Application] This invention condenses on a record-medium side by using outgoing radiation light from the light source as a minute spot, and relates to the optical head equipment suitable for playback of the disk with which especially information was recorded on high density in the optical head equipment which detects the optical reinforcement of the reflected light from this condensing point with a photodetector, and reproduces information.

[Translation done.]

PRIOR ART

[Description of the Prior Art] The conventional example is explained with reference to a drawing. The schematic diagram showing the optical head equipment of the former [drawing 8] and drawing 9 are explanatory drawings for explaining the modulation condition of the light by the pit formed in the disk. The optical head equipment 1 shown in drawing 8 consists of the light source 2 which consists of a laser diode etc., the plate beam splitter 3, a condenser lens 4, a cylindrical lens 5, and a photodetector 6 that consists of a pin photodiode etc.
[0003] This optical head equipment 1 condenses the outgoing radiation light from the light source 2 on Disk (record-medium side) D as a minute spot through a condenser lens 4, detects the optical reinforcement of the reflected light (henceforth "return light") from this condensing point with a photodetector 6 through a cylindrical lens 5, and reproduces information. The thing in which such a playback method is possible is for input light to be modulated by this pit P and for return luminous intensity to change, when the light condensed with the condenser lens 4 is irradiated by the pit P formed in said disk D as an input light of a minute spot. The reading precision by the optical arm head of such a method is greatly influenced by the optical modulation factor of return light.
[0004] here -- the above-mentioned modulation factor -- modulation factor ={(maximum of RF signal) - (minimum value of RF signal)}/{(maximum of a RF signal) + (minimum value of a RF signal)}
That is, it is modulation factor =(AC component of regenerative signal)/(DC component of regenerative signal) x1/2. In addition, in the above-mentioned formula, the RF signal expresses the optical modulation factor because the quantity of light of return light is proportional to the electric RF signal which is a regenerative signal.
[0005] Moreover, supposing a noise level is fixed between the above-mentioned modulation factor and the C/N ratio (Carrier to Noise ratio) in optical playback, they are delta(C/N) = 20 and log (variation of a modulation factor).
{However, variation of delta(C/N):C/N ratio}
There is ******. That is, in order to raise a C/N ratio and to maintain an error rate, it is required to make said modulation factor high.
[0006] The playback information by the return light from Pit P is the information on various spatial frequency optically here, from the pit train of high density, the optical information of high spatial frequency is read and the playback RF signal of high frequency is obtained. Moreover, from the pit train of low density, the optical information of low spatial frequency is acquired and the playback RF signal of low frequency is obtained.
[0007] Although the optical information whose information on media is spatial frequency is included in the light which returns to the opening R (refer to drawing 9 (a)) of a condenser lens (objective lens) 4, in return light, the location where effect appears within a opening changes with height of spatial frequency. That is, supposing the migration direction of Disk D is the direction of space in drawing 9 , in the optical information of high spatial frequency, effect will appear in the outside of the opening of a lens. For example, the effect by the modulation becomes large as Li and Lo show from the core of a lens opening among the return light from a pit train with high spatial frequency and it goes to the periphery section.
[0008] Therefore, as for the space information more than the frequency (cut off frequency) of a fixed value, what (it reads) it comes out outside the lens opening R, and information is transmitted for as Lo shows becomes impossible. moreover, as shown in Li, effect comes to produce the space information on frequency lower than it in the periphery section of the lens opening R, and a cut off frequency is approached -- alike -- following -- informational transfer -- carrying out -- ****** -- **

[Translation done.]

EFFECT OF THE INVENTION

[Effect of the Invention] As mentioned above, according to this invention, even if it is the case where densification of the record pit of a disk is carried out, the fall of a modulation factor can be suppressed low and the optical head equipment whose reading precision improves can be offered.

[Translation done.]

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] As mentioned above, in optical head equipment, a modulation factor will fall and C/N will deteriorate as are shown in drawing 10 , and the density of a record pit becomes high and informational spatial frequency becomes high, when the disk which carried out densification of the record pit is played. Therefore, if it becomes more than 0.80/micrometer in the case of the equipment which has the property of the diagram shown, for example in drawing 10 , the density (the number of pits to an unit size), i.e., the pit density, of spatial frequency, a modulation factor will fall sharply and C/N-ary in informational playback will get very bad. Therefore, by the playback device which used the optical head equipment of structure conventionally [as shown in drawing 8], a limit is in the densification of media, such as making pit density high, for example.
[0010] This invention is for solving the above-mentioned technical problem, and even if it makes recording density of media high, the modulation factor when detecting return light can be made high, and it aims at offering the optical head equipment which can prevent the fall of a C/N ratio.

[Translation done.]

MEANS

[Means for Solving the Problem] The optical head equipment by this invention is characterized by to establish a means attenuate optical reinforcement of a predetermined field which includes a core to said reflected light from optical reinforcement of other peripheries in optical head equipment which condenses on a record medium side , detects optical reinforcement of the reflected light from this condensing point with a photodetector , and reproduces information by using outgoing radiation light from the light source as a minute spot .

[Translation done.]

OPERATION

[Function] With the above-mentioned means, the optical reinforcement of the predetermined field which includes a core among the reflected lights from a record medium is reduced from the periphery. Therefore, in return light, the high modulation component of spatial frequency comes to be obtained by the ratio higher than the modulation component of low spatial frequency. That is, although a modulation factor is obtained by (AC component / DC component) as mentioned above, by reducing the optical reinforcement of a core, the ratio of DC component of a denominator falls and the modulation factor to high spatial frequency becomes high. Therefore, reading precision becomes high even if it is the case where recording density of the information in media is made high.

[Translation done.]

EXAMPLE

[Example] Hereafter, a drawing explains the example of this invention. The outline plan showing the optical head equipment of one example which drawing 1 requires for this invention, and drawing 2 are the plans showing an attenuation filter. The optical head equipment 21 shown in drawing 1 has the light source 22 which consists of a laser diode etc., the plate beam splitter 23, the condenser lens 24, the cylindrical lens 25, and the photodetector 26 that consists of a pin photodiode etc., and the attenuation filter 27 is infixed in the path to which return light results in a photodetector 26 further.
[0014] This optical head equipment 21 condenses the outgoing radiation light from the light source 22 on Disk (record-medium side) D as a minute spot through a condenser lens 24, detects the optical reinforcement of the reflected light from this condensing point with a photodetector 26 through the attenuation filter 27 and a cylindrical lens 25, and reproduces information.
[0015] As shown in drawing 2 , the protection-from-light band 28 with which said attenuation filter 27 is prolonged in the direction of tracking (= radial [of Disk D]) in the core of the linear-velocity direction over Disk D is formed. This protection-from-light band 28 is for shading the light of the field which includes a core to the reflected light from Disk D, and passing only the light of other peripheries. In addition, although this protection-from-light band 28 shall shade light completely in this example, it is not necessary to intercept light completely in this protection-from-light band 28, and the amount of transmitted lights should just fall rather than other portions.
[0016] An operation of the optical head equipment 21 of the above-mentioned configuration is explained. The light by which outgoing radiation was carried out from the light source 22 passes a beam splitter 23, and is condensed by the surface of Disk D with a condenser lens 24. The pit of Disk D becomes irregular, it is reflected by the right angle by the beam splitter 23 through said condenser lens 24, and this condensed light is led to said attenuation filter 27, penetrates this, and is detected by the photodetector 26. With this attenuation filter 27, the light of the field which contains a part for a core with said protection-from-light band 28 is shaded according to the formation area of a protection-from-light band, and the ratio of the amount of transmitted lights of the both sides to the direction of a line becomes higher than the portion of the protection-from-light band 28 of a core.
[0017] As mentioned above, as for the high modulation component of spatial frequency, effect remains on both sides of the direction of a line mostly to return light. And the light of a core with little effect of the modulation component of high spatial frequency is removed. Therefore, in the modulation component of return light, with high spatial frequency, the ratio of AC component to the ratio of DC component becomes high, and a modulation factor becomes high. Therefore, in the regenerative signal by return light, a C/N ratio improves and reading precision becomes high.
[0018] The diagram showing the relation of the spatial frequency and the modulation factor to the rate of protection from light of the attenuation filter 27 by the optical head equipment 21 of the above-mentioned configuration is shown in drawing 7 . In addition, the rate of protection from light is expressed by the percentage when setting the diameter of a opening of return light [as opposed to d and said attenuation filter 27 for the width of face of said protection-from-light band 28] to a, and let it be the value computed by rate (%) of protection from light =(d/a)x100.
[0019] As shown in the diagram of drawing 7 , when the rate of protection from light is variously changed in 20% thru/or 60% of range, even if spatial frequency becomes high (pit density is), the fall of a modulation factor is suppressed rather than the conventional example shown in drawing 10 . Moreover, the more it increases the rate of protection from light, the more the rate of decline in the percent modulation to the increment in spatial frequency is stopped low. Consequently, even if it is the case where densification of the record pit of a disk is carried out, the fall of a modulation factor can be suppressed low, deterioration of a C/N ratio can be prevented, and reading precision can be raised.
[0020] This invention is not limited to the above-mentioned example, but various deformation implementation is possible for it. for example, the configuration of said protection-from-light band is shown in this drawing (b) in the shape of [which is shown in drawing 3 (a)] an outline of I characters -- as -- an outline -- leaves -- the light of the predetermined field which makes it a round shape etc. and includes the core of return light in a **, respectively as shown in this drawing (c) is shaded, and you may make it attenuate luminous intensity Moreover, you may form by the members X, Y, and Z of a rate of protection from light which divided the attenuation filter 27 into plurality (an illustration example five division), and is different, respectively as shown in drawing 4 .
[0021] Furthermore, as the optical reinforcement of a predetermined field including a core is shown in drawing 5 to said reflected light as a means attenuated from the optical reinforcement of other peripheries The pin photo diode as said photodetector 26 may be divided into eight in the direction of a line, a core (portion corresponding to the low-frequency

component of return light) may be quadrisected comparatively small (B, C, F, G), and other portions may be quadrisected so that it may face across these outsides (A, D, E, H). In this case, as shown in drawing 6 , return light to Cores B, C, F, and G is not detected for detection of the RF signal corresponding to recording information, but the result of an operation of (A+D+E+H) is used for it. The effect of attenuating the luminous intensity of the field which includes the core of return light like the above by this is acquired.

[0022] And a focal error signal is (A+B+G+H)-(C+D+E+F).
********** detects and a tracking error signal is (A+B+C+D)-(E+F+G+H).
********** detects.

[Translation done.]

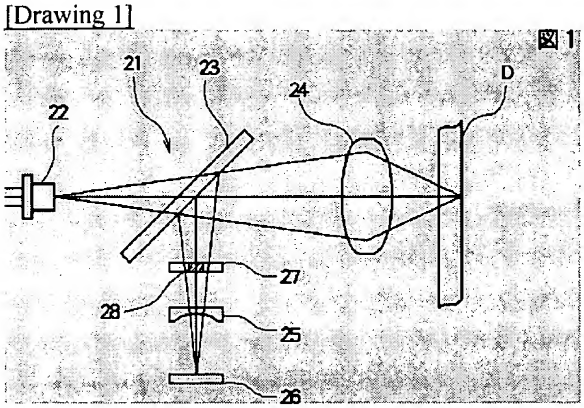
DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the outline plan showing the optical head equipment of one example concerning this invention.
[Drawing 2] It is the plan showing an attenuation filter.
[Drawing 3] (a) Or (c) is the plan showing the modification of an attenuation filter.
[Drawing 4] It is the plan showing the modification of an attenuation filter.
[Drawing 5] It is the plan showing the modification of a pin photodiode.
[Drawing 6] It is the side elevation showing the incidence condition to the PINHO photodiode of return light.
[Drawing 7] It is the diagram showing the relation of the spatial frequency and the modulation factor to the rate of protection from light.
[Drawing 8] It is the outline plan showing conventional optical head equipment.
[Drawing 9] It is drawing for explaining the modulation condition of the light by the pit formed in the disk.
[Drawing 10] It is the diagram showing the relation between the spatial frequency in equipment, and change of a modulation factor conventionally.
[Description of Notations]
21 Optical Head Equipment
22 Light Source
23 Beam Splitter
24 Condenser Lens
25 Cylindrical Lens
26 Photodetector
27 Attenuation Filter
28 Protection-from-Light Band

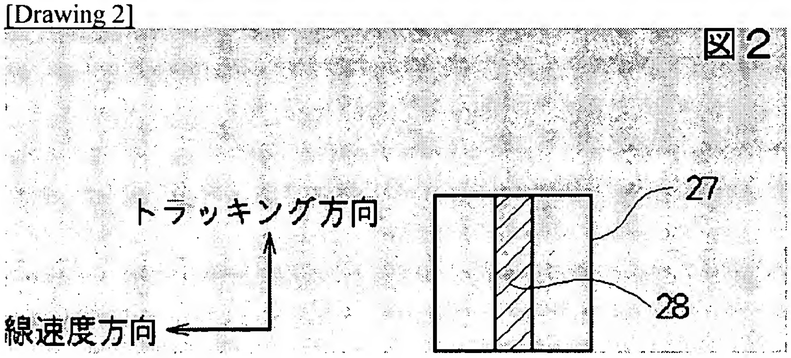
[Translation done.]

DRAWINGS

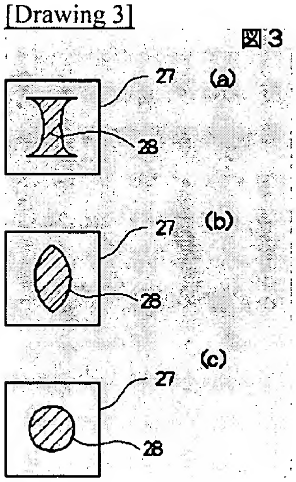
[Drawing 1]



[Drawing 2]

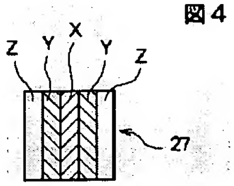


[Drawing 3]



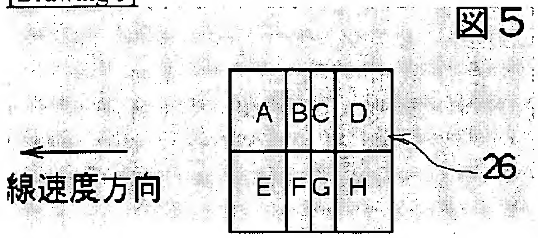
[Drawing 4]

図4



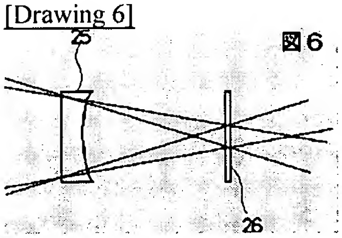
[Drawing 5]

図5



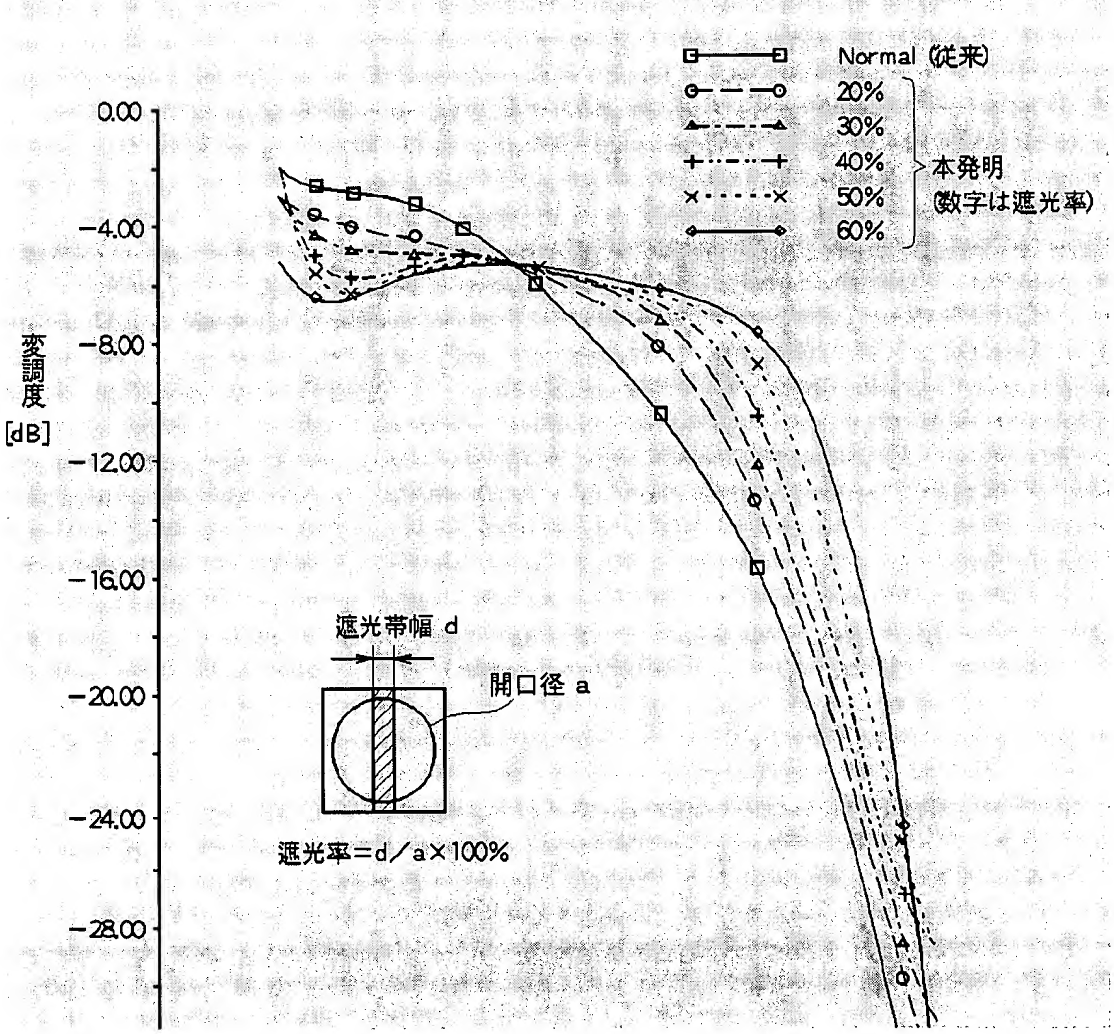
[Drawing 6]

図6

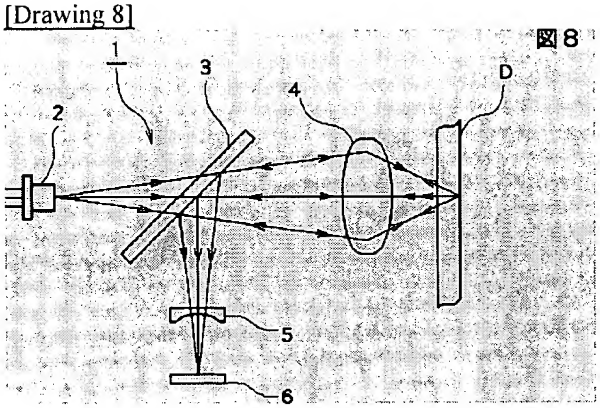


[Drawing 7]

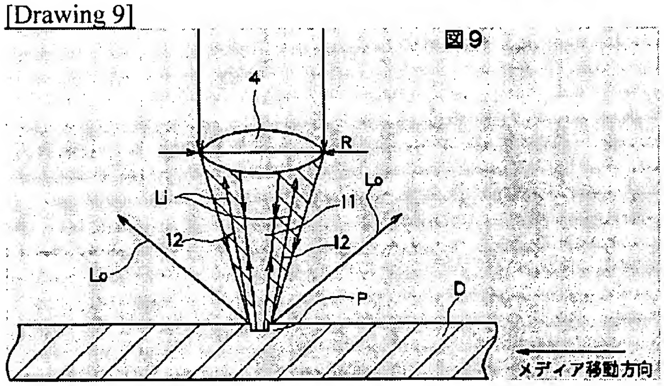
図7



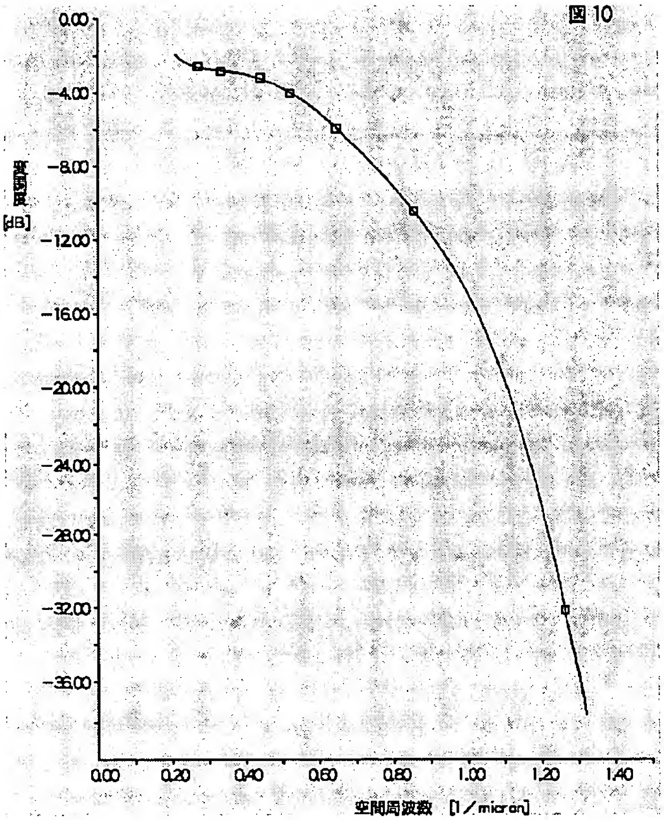
[Drawing 8]



[Drawing 9]



[Drawing 10]



[Translation done.]